

BOILER TEST CONDITIONS SUMMARY**IGS Unit 1 Boiler Overfire Air System and SH Platen Extension POST- OUTAGE Testing**

State of Utah Required Testing (to demonstrate no increase in CO due to installation of Overfire Air System)

OFA Diagnostics Testing (to determine best spot to operate and develop control curves)

Each test point needs 1 1/2 hour, allowing ½ hour between test points to lower O2, pull fly ash and sootblow for temperatures

TEST #	DATE & TIME	LOAD	TEST CONDITIONS	OFA%	OFA Dampers	TIME	TARGET	Air Flow	CEM	TEST	STACK	TEST
							O2% test grid		NOx	NOx	CO	CO
Day 1	09/06/2003 Sat 6:30- 19:0	950	No Westridge or Dugout Coal Pulv U1 F o/s	0%	inlet, 1/3, 2/3- dampers closed		3.5					
							3.0					
							2.5					
							2.0					
							3.5					
Day 2	09/7/2003 Sun 6:30- 19:0	950	No Westridge or Dugout Coal Pulv U1 F o/s	7%	1/3 open- balanced, 2/3 closed, inlets open		3.0					
							2.5					
							2.0					
							3.5					
							3.0					
Day 3	09/8/2003 Mon 6:30- 19:0	950	No Westridge or Dugout Coal Pulv U1 F o/s	12%	2/3 open- balanced, 1/3 closed, inlets open		2.5					
							2.0					
							4.0					
							3.5					
							3.0					
Day 4	09/9/2003 Tues 6:30- 19:0	950	No Westridge Coal Pulv U1 F o/s	12%	2/3 open- balanced, 1/3 closed, inlets open		makeup test day					

NOTE: O2 and CO% based on Boiler Outlet Grd values

Coal Supply Requirements- NO WestRidge or Dugout, need SUFCO coal straight for best results

see- Operation Test Setup for more details

IP7_035421

EQUIPMENT BID AND RECORD

USE 24HR TIME FORMAT

Requested by Aaron Nissen Div. IPSC
 Sec. IGS Submitted by _____ Operator _____ Time _____ Date _____

☐ Out of Service
☐ Clearance TO Garry Christensen/ Aaron Nissen Div. IPSC
☒ O.K. Responsible Party Sec. IGS

EQUIPMENT REQUESTED: Unit 1 Boiler Overfire Air Tests,, at 950 MW gross-
3 days, MStm Temp 1005 F/ HRH 1005 F/ throttled conditions.

NATURE OF WORK: State of Utah Required Testing for the Overfire Air System

BID Time
FROM: Saturday 06:00- 19:00 MDST 09/06/03 **TO:** Tuesday 06:00- 19:00 MDST 09/9/03
 Time Date Time Date

WORK Time
FROM: Saturday 06:30- 18:30 MDST 09/06/03 **TO:** Thursday 06:30- 16:30 MDST 09/9/03
 Time Date Time Date

MST=Mountain Standard MDST=Mountain Daylight PST=Pacific Standard PDST=Pacific Daylight

PREPARATION REQUIRED: Throttle Press& valve position as needed for load / Main Steam Temp 1005F/
Hot Reheat 1005 F, 7 pulverizer operation (pulv H o/s). Boiler (in local), control reheat temps
with bias dampers (no reheat sprays), no sootblowing during each test period of 2 hours),
minimize convection pass sootblowing prior to each test (previous shift) so able to achieve Mstm
& HRH temps at 950 MW, main steam temperature control by sprays is ok (but best to minimize, no
prim sprays if possible)), no boiler drum blowdown during the test. Remove all pulverizer and
fan biases. Isolate Unit 1 CRH to aux steam supply.
COAL- no Westridge or Dugout (perference is straight SUFCO)

BID APPROVED:

OPS Supv. _____ Time _____ Date _____ Removed by _____ Time _____ Date _____

Supt. _____ Time _____ Date _____ Issued to _____ Time _____ Date _____

Dispatcher _____ Time _____ Date _____ Returned by _____ Time _____ Date _____

EQUIPMENT NORMAL: _____ Time _____ Date _____ By _____ Operator _____ Supv. _____

Remarks: _____

Boiler Test Plan for Over Fire Air System and SH Platen Extension

9/03/03 r0

IGS Unit 1 POST-Outage Testing

Testing Objectives- There are a series of Boiler Tests which are being requested following the modifications which have been made to the Unit 1 boiler. The Unit 1 Major Outage(4 week) modifications consisted of installing an overfire air system and extending the superheater platen section. The objective of the POST-outage testing is as follows:

State of Utah- Required Testing- document operating conditions after the Overfire Air System has been installed. POST-outage testing is being conducted on the request from the Utah Division of Air Quality based on concerns with an increase in CO emission levels, operating with the overfire air system. The Boiler Testing will be at POST-Outage test conditions (conducted on 6/10-12/2003) at a Load of 950 MWgross, NO Westridge coal (best if SUFCO is straight), O2%, CO, NOx and Overfire Air% varies (see Boiler Test Conditions and Operational Test Setup).

Test Personal: The testing is being conducted by IPSC Engineering who is leasing test quality gas analyzers from Power Generation Technologies (PGT).

Test Coordinators- Garry Christensen and Aaron Nissen
OFA System Controls and Dampers- Ken Neilson & Phil Hailes
Gas Analyzers and Test Grid- Garry Christensen & Rob Jeffery
Coal & Fly Ash sample collection- Dave Spence & Bill Tanner
Fly ash sample collection- - ISG Rod Hansen, Rick Fowles/ Kurt Aldredge

Test Method- Testing will utilize the PI data acquisition system to document test conditions. In addition, a test grid is setup at the boiler outlet (11th floor) using 14 test probes at four different depths for a total of 56 points. The gas sampling system is setup with both east and west side averaging systems consisting of bubblers, vacuum pumps, chillers and desiccant filters. The cooled, dry, filtered gas samples are then analyzed for O2, CO2, CO and NOx. Thermocouples are also at each location to get averaged boiler gas outlet temperatures.

NOTE, we will utilize the O2 measurement at the boiler outlet. We are seeing a bias between station O2 and the O2 at the boiler outlet grid. The O2% at the boiler outlet, however, agrees with higher Air Flow shown in CCS, correlates with the higher ID Fan rpm and amps, plus correlates with higher NOx and low CO levels. As part of the testing, we will try to reconcile why we have high station O2 levels.

In addition to east and west side averaged gas conditions, individual test points will also be taken during a separate test to develop backpass test grid profiles. These profiles will include O2, CO, NOx and temperatures which will be used to troubleshoot and diagnosis burner setup and secondary air plus overfire air flow balancing.

OFA System 1/3 and 2/3 dampers plus OFA secondary air inlet dampers will need position checked during the course of the testing.

Fly ash samples will also be taken and correlated with the test results. We will need 2 Operators to help support fly ash sample collection. ISG will be collecting the fly ash samples at each of the different test points. All fly ash hopper rows need to be available (no maintenance work) and hoppers will need to be pulled down prior to the test (night shift) and between each test point.

Coal samples will also be taken throughout the test period at the coal feeder inlet (test taps installed special for testing). Note: there maybe a certain amount of coal spillage created while collecting these coal samples. Bottom ash samples will also be collected.

Boiler Performance Testing- Each test point needs 2 hours, allowing ½ to 1 hour between test points to lower O2, pull fly ash and sootblow for temperatures. Prior to each test period (daily), the gas analyzers need to be started, warmed up and calibrated. This process takes 1 to 1 ½ hours to complete. During this time, all tubing, bubblers, chillers, desiccant filters, and dust filters will be checked out.

Operational Test Setup- Boiler OFA & Platen Tests

Load (MWgross) 950

Controls- boiler to local (or manual), Boiler Test Objective is for stable boiler/ throttle pressure and let MWs float.

(throttling control valves okay- this is not a turbine test at valves wide open)
Overfire Air System to manual

Throttle Press & Control Valve Position as needed for load

Main Steam Temp (F) 1005

Main Steam spray (kp/h) <200

Hot Reheat Temp (F) 1005

Reheat Sprays (kp/h) 0

Bias Dampers (%) may have to take PRH side to manual & set between 30- 45%, to control RH temps

Sootblowing as required to achieve Main Stm, HRH and FEGT temps

No sootblowing (during each test period of 2 hrs), sootblowing is allowed between each test

NOTE: for 950 MWg operation, need to allow SH & RH areas to get dirtier, but blow waterwalls to achieve FEGT (furnace exit gas temp) and EGOT (economizer gas outlet temp)

FEGT target (F) 2200, controlled by waterwall sootblowing

EGOT target (F) 760

O2 levels (measured at boiler outlet with test equipment)

VARIES from 3.5%, 3.0%, & 2.5% at 2 hour increments

Note: there is a discrepancy between station instrumentation and local test analyzers (local reads are higher by 0.5% to 1.0% O2)

Over Fire Air System local control

1/3 & 2/3 port dampers, VARIES from 0% OFA (baseline), both closed or inlet dampers closed
5% (1/3 damper open, 2/3 damper closed, balanced flow all 4 corners)
8% (2/3 damper open, 1/3 damper closed)
12% (2/3 & 1/3 dampers open)

OFA inlet dampers south (SW & SE) dampers throttled ~45% to get balanced N to S flows

NOx level target (#/mbtu) < 0.37

CO (ppm) < 100

Primary Air Duct Press ("wc) 43

Pulverizer Configuration- 7 I/S, U1C o/s (Sec air damper - 10%)

Note- Remove all pulverizer biasing (unless absolutely necessary due to unmanageable coal dribble)

NOTE: U1 H pulverizer should be available from Maintenance around 5/1/03

Need all normally running equipment in-service (7 Pulv, all FD, PA & ID fans, etc.). This ensures good uniform air and gas flow distribution.

No Boiler Blowdown during the testing period

Isolate Unit 1 CRH to aux steam supply and route all building heat (if in service) drains to Unit 2.

Coal Supply - No Westridge or Dugout coal, need straight SUFCO for best emission results

No Rocks, please

NOTES:

1) Fly Ash Samples- need to be taken during each test period (need support of 2 Operators for fly ash sample collection). Fly Ash Hoppers need to be pulled down prior to the test (night shift) and between each test point. ISG will be collecting the fly ash samples at each test points. All fly ash hopper rows need to be available (no maintenance work)

2) Coal Samples will also be taken at each test point at the coal feeder inlet (new test coal sample collection ports). Note: there may be a certain amount of coal spillage created while collecting these coal samples.

3) Bottom ash samples will also be collected during some of the tests.

4) Do not washdown boiler in the backpass areas, due to test equipment, analyzers and computers.

5) PI system – needs to be up and running, no downtime or backups

6) CEM system – PI interface needs to be working